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<p>(54) Title: AUXILIARY UNIT FOR ROAD GRADING</p> <p>(57) Abstract</p> <p>Auxiliary unit for road grading intended for attachment to a vehicle, preferably a tractor excavator (1) or the like. Characterizing for the invention is that the unit includes a frame and a working member (22) carried by said frame, the working member being such as a road grader blade, and in that the frame is removably connected to the vehicle (1) partly by means (2, 6, 32) guiding the frame and partly by the frame itself and thus means (3, 4, 16) regulating the level of the blade. Said level regulating means partly comprises extensible struts (16, 17) or hydraulic cylinders, and partly supporting legs (3, 4) associated with the tractor excavator. With the aid of said level regulating means the setting of the blade in relation to a ground plane can be finely adjusted. At the same time, the unit may be steered with the aid of the steering means (2, 6, 32) associated with the vehicle.</p>		

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AUXILIARY UNIT FOR ROAD GRADING

The present invention relates to an auxiliary unit for road grading, which is primarily suitable for coupling to a tractor excavator or the like.

5 Road graders are already known and in general use. These machines are implemented solely to function as graders, i.e. they are solely for removing snow and ice from ice-covered winter roads and for grading and smoothing dirt roads. To a
10 certain extent they can also function as kerb scrapers. The known graders have a number of disadvantages, however. They are very large, unwieldy and clumsy in traffic as well as being extremely expensive to fabricate. In addition they have a very low degree of utilisation, in the order of
15 magnitude 20%, which makes their operational costs considerable. The machines existing today are obsolescent and worn, and their replacement is hardly conceivable against the background of the high costs they involve.
20 The use of the auxiliary unit for road grading in accordance with the invention results in that the disadvantages given above are avoided while at the same time there is provided a road grader which is comparatively cheap to manufacture and as an auxiliary unit it is easy to fit to such as
25 existing tractor excavators.

The unit in accordance with the invention is primarily characterized in that it includes a frame carrying a working member, preferably a scraper blade, the frame being removably coupled to the vehicle partly via the guiding means of the frame and partly via means regulating the height of the frame and thus the height of the scraper blade. This and further characterizing features are disclosed in the accompanying claims.

35 The invention will now be described in detail and with reference to the accompanying drawings on which:-

Figure 1 is a schematic side view of the unit coupled to a conventional tractor excavator;

5 Figure 2 is a view from above of the unit coupled to a conventional tractor excavator, and for the sake of clarity the latter has been shown without its associated power shovel;

10 Figure 3 is a schematic view of the unit seen from the front with its movement-transmitting members, steering inhibiting and turn or twisting inhibiting means;

Figure 4 is a view from above and to an enlarged scale of the rear end of the frame, and

15 Figure 5 is a side view to an enlarged scale of the frame and is intended to illustrate steering inhibiting means.

In connection with the appended drawings, the auxiliary unit for road grading is illustrated adapted to a tractor excavator 20. of a conventional type. The use here of the words front, forward, rear and backward is with reference to the normal forward travel of the vehicle, and not necessarily to the working direction of the unit. It should also be noted that the unit is suitable for adapting to other kinds of vehicle, 25 and the excavator described in the embodiment should only be regarded as an example.

The illustrated tractor excavator 1, e.g. a centrally articulated vehicle, may include a front loader, e.g. a bucket, and a backwardly directed excavating apparatus 2. On either side of the vehicle at its rear portion there is a supporting leg 3,4 or the like, these legs being in a retracted position during travel between working locations and in a lowered position bearing against the ground during 35 excavation work or the like. The supporting legs illustrated on the drawing are solely to be regarded as examples, and other types of leg can be used. The vehicle is also usually equipped with a towing hook 5 arranged centrally in the

longitudinal direction of the vehicle.

The rearward end of the excavating apparatus 2 is removably connected to a bucket or the like via a quick release coupling attachment 6.

The auxiliary unit for road grading in accordance with the invention, includes a frame formed by two outer beams 7,8 rigidly attached to each other via a rear 9 and a forward 10 cross-beam. The rear cross-beam 9 is rotatably connected to a wheel carrying beam 29, the latter in turn carrying two steering wheels 11,12, suspended for pivotal movement about their vertical axes and mutually connected via a track rod 13.

The frame is further provided with a triangular member 14 with its long side hingedly connected to the forward cross-beam 10, and at its apex it is connected to the vehicle towing eye 5 via a rotatable eye bolt 15. The outer beam 7 is connected to the support leg 4 via an extendable strut 17 and the outer beam 8 is connected to the leg 3 via a similar extendable strut 16.

The forward cross-beam 10 is provided with two further brackets 18,19 via which a substantially parallel epipedic frame structure 20 is pivotably attached to the cross-beam 10. The frame 20 carries a turning plate 21, to which there is attached a working member, preferably a scraper blade 22. The scraper blade 22 can be given an angular attitude conventionally and can be laterally moved into different positions in relation to the longitudinal axis on the vehicle with the aid of not more closely illustrated hydraulic cylinders 23. The cylinders 23 connect to the frame and plate via a triangular plate, which can be disconnected from the plate 21 via a removable bolt, enabling the plate 21 to be turned half a revolution, thus turning the working member for work in the opposite direction.

The frame 20 is pivotably connected at its rearward face to a link 43, which is a part of a link mechanism, the other end of the link 43 being in turn connected to the end of a bell crank 24 forming the other part of the link mechanism, 5 with the bell crank formed as a substantially triangular plate. The free end of the other arm of the bell crank is pivotably connected to a piston-cylinder means 25, which has its end facing away from the link mechanism connected to the rear cross-beam 29 at 26. A further cross-beam 27 10 carries a bracket 28 for pivotably mounting the fulcrum of the bell crank 24. Using the hydraulic cylinder 25 and link mechanism, the position of the blade 22 in relation to the ground can be changed, while the blade is kept parallel to the ground by the frame 20 being pivoted about its brackets 15 18,19.

Fine adjustment of the scraper blade and possible oblique setting of it in relation to the plane of the ground then takes place by regulating the supporting legs 3,4 of the 20 vehicle. Accordingly, lowering the supporting leg 3 will lower the rear section of the outer frame beam 8 via the strut 16 simultaneously as a rotation of the scraper unit takes place in relation to the towing hook 5 and the wheel carrying beam 29. In turn, this results in lowering one end 25 of the blade 22. It will be understood that the blade 22 can thus assume different attitudes in relation to the ground plane with the aid of the supporting legs 3,4 and struts 16,17.

At its rear end the unit is provided with means which can 30 inhibit the steering function of the wheels 12,13 and the implementation and function of the means will now be described.

The beam 29 is provided with an elongate, substantially cylindrically shaped member 30 extending centrally in the 35 longitudinal direction of the unit. On the upwardly facing surface of the member, and in its longitudinal direction there is an opening 31, having a width B in a rearward part, this width being greater than the width of a movement trans-

mitting element, e.g. in the form of a ball 32, mounted on the quick release coupling 6. A forward portion of the member 30 has an opening with a width b, which is less than the width or diameter of said element. In the rearward portion 5 of the member 30 and diametrically opposite the opening 31 there is a longitudinal opening 33. A member 34 in the form of a steel flat is pivotably attached to the member 30 such that a generally triangular portion of the flat is allowed to project up through the opening 33 in the member 30 at 10 its rearmost portion. The flat 34 has two abutment edges, the lower one of which is in contact with a vertical, screwed rod or the like 35. A sleeve 36, suitably fastened to the beam 29, serves as a guide for the rod 35, the upper side of the sleeve also serving as an abutment for a compression 15 spring 37, the other end of which is biassed against a nut 38 threaded onto the rod 35, thus urging the latter against the lower abutment surface on the flat 34. The rod 35 can move freely in the sleeve 36, and at its lower end it is pivotably connected to one end of an arm 39, the other end of which acts 20 on a pair of brake pads or the like arranged in a housing 40 attached to the beam 29. The housing 40 accommodates a steel flat 41 adapted to move reciprocatingly in the housing in the directions of the double arrow P, one end of the flat 41 being fastened to a rod 42, the other end of the rod being 25 mounted for horizontal, pivoting movement on the suspension frame of the wheel 11. The reciprocatory movement is available as long as the brake pads are not actuated, which is the case as long as the ball 32 is in the member 30 in a rearward position and in contact with the upper abutment surface of 30 the flat 34, thus ensuring that the rod 35 is in a downward position against the bias of the spring 37. In this case the steering movements of the tractor, e.g. in a vehicle with central articulation, are transmitted via the excavating unit 2 and ball 32 to the road scraper unit wheels via the 35 cylinder 30 and the wheel-carrying beam 29, the wheels 11,12 then assuming a desired steering position.

During travel to a working site, the ball can be moved out of engagement with the member 30, the wheels then being locked by the brake pads in the housing 40 being actuated to lock the members 41,42 and thus inhibit the steering function of the wheels. Actuation of the pads takes place by the pressure from the ball 32 on the flat 34 ceasing, the spring 34 then urging the flat upwards together with the rod 35, thus causing the arm 39 to actuate the brake pads. The unit can then be regarded as a trailing vehicle for movement from site to site. Alternatively, the ball can be taken to a forward position in the member 30 along the opening 31. In this case as well, the ball comes out of engagement with the upper abutment surface of the flat 34, thus locking the wheel pair 11,12. In the mentioned forward position the ball assumes a position in which the width of the opening 31 is less than the diameter of the ball, whereby the unit with its rearward portion can be lifted up from the ground with the aid of the excavator unit 2. The road scraper unit can thus be considered as an appliance associated with the machine.

It is obvious that the auxiliary unit for road grading in accordance with the invention can very readily be applied to a tractor excavator or similar machine. No further arrangements on the machine are required apart from hydraulic hose connections between the vehicle and cylinders 23 and 25, as well as extra fastening means, e.g. of the quick release type, on the supporting legs 3,4 for the struts 16,17. All steering movements and setting of the scraper blade then take place from the driver's cabin using existing operating controls.

It is of course possible within the scope of the invention to replace the extendable struts 16,17 with hydraulic cylinders or the like extensible means, such means being connected via lines having associated non-return valves and which are preferably connected to the hydraulic lines for regulating the positions of the supporting legs.

Apart from the scraper blade illustrated in the figures, other working members can also be adapted to the unit, e.g. different kinds of mowing knives or scraping means.

CLAIMS

1. An auxiliary road grading unit for a vehicle provided with supporting legs, preferably a tractor excavator or the like, and having an auxiliary unit (2) connected to it, said auxiliary road grading unit including a frame (7,8,9,10,29)
5 carrying a working member (22), characterized in that the frame includes rear (9) and forward (10) cross-beams, the terms "rear" and "forward" generally referring to the direction of normal travel of the vehicle and not necessarily to that of the working member, in that a
10 member (14) is arranged at the forward beam (10), via which the grading unit is rotatably and disengageably connected to a towing means (5) associated with the vehicle, in that there is a member (30) arranged at the rear cross-beam (9), via which the grader unit is connected rotatably and
15 disengageably to the auxiliary unit (2), said towing means (5) and auxiliary unit (2) comprising the frame guiding means, and in that level-regulating means (16,17) are articulately arranged between the frame and the vehicle supporting legs in the vicinity of the forward cross-beam.
20
2. Grading unit as claimed in claim 1,
characterized in that the level regulating means are formed as extensible members (16,17).
- 25 3. Grading unit as claimed in claim 2,
characterized in that the rear cross-beam (9) is in articulated engagement with a wheel-carrying beam (29) extending parallel to said cross-beam.
- 30 4. Grading unit as claimed in claim 3,
characterized in that the means guiding the frame include (a) an auxiliary unit (2) connected to the vehicle, (b) a coupling means (6) connected to said auxiliary unit, (c) a member (30) associated with the
35 wheel-carrying beam (29), said member being removably connected to said auxiliary unit (2) via a movement-

transmitting element (32) associated with the coupling means (6), whereby movements of the auxiliary unit (2) are transmitted to the steering wheels arranged on the wheel-carrying beam, said transmission being via the coupling means (6), the movement-transmitting element (32) and the member (30).

5. Unit as claimed in claim 4, characterized in that the means (30) associated with the wheel-carrying beam comprises a hollow beam or trough member (30) extending in the longitudinal direction of the unit, the movement transmitting element (32), which is preferably in the form of a ball, being allowed to assume different positions in said trough member (30).

10 15 6. Unit as claimed in claim 5, characterized in that the member (30) has an upper opening including at least two opening portions with different widths, of which one portion is wider than the movement transmitting element, and in that the width of the other opening portion is less than the width of said element, there also being a lower opening accommodating a means (34) for inhibiting steering, this means being pivotable vertically in relation to said member (30).

20 25 30 7. Unit as claimed in claim 6, characterized in that the means (34) inhibiting steering has two abutment surfaces, of which one, via a spring biassed means (35) and an arm (39) pivotably connected thereto is in communication via braking elements with means (41,42) inhibiting turning of the steering wheels.

35 8. Unit as claimed in claim 7, characterized in that the second abutment surface of the steering inhibiting member (34) forms a support surface for the movement transmitting element (32) when it is in the first of said different positions, the steering inhibiting member (34) then being pressed downwards to actuate with its other abutment surface

the spring-biased member (35) and thus the braking elements associated with the arm, whereby these release the turning inhibiting means so that it is allowed to move freely in relation to said braking elements.

5

9. Unit as claimed in claim 8, characterized in that in a position separate from said first position the movement transmitting element (32) actuates the braking elements so that these lock the turning inhibiting means.

10

10. Unit as claimed in claims 6-9, characterized in that the second opening portion forms support for the movement transmitting element (32) so that under the action of the auxiliary unit (2) it can move the rear part of the grader unit to different positions in a vertical plane.

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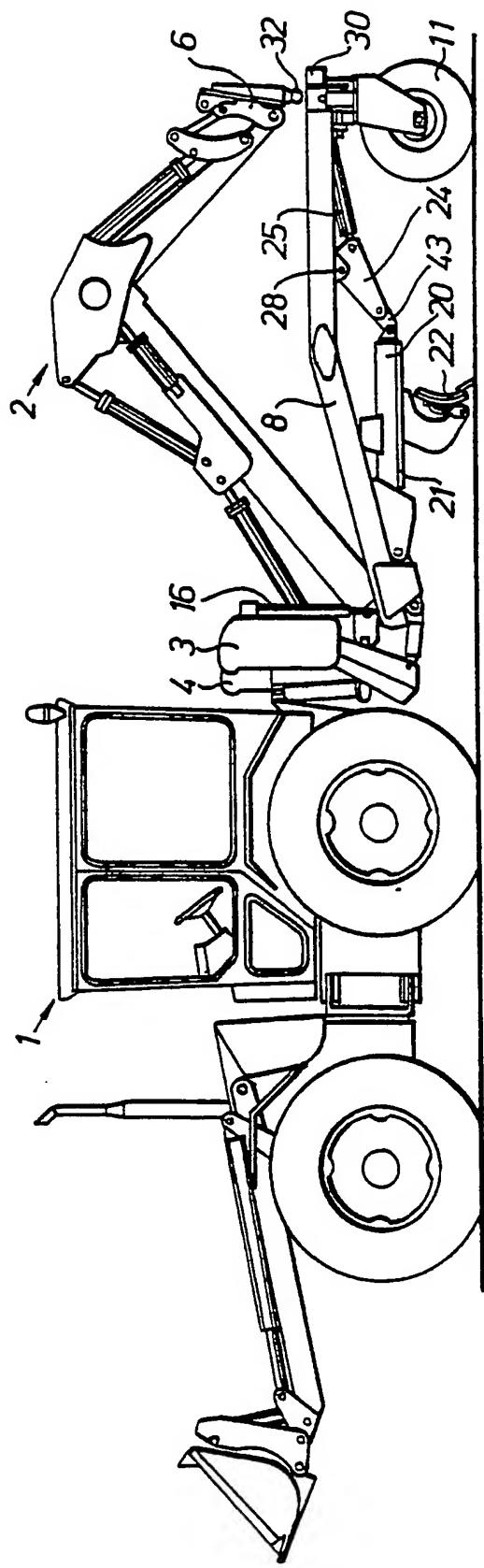
Fig.1

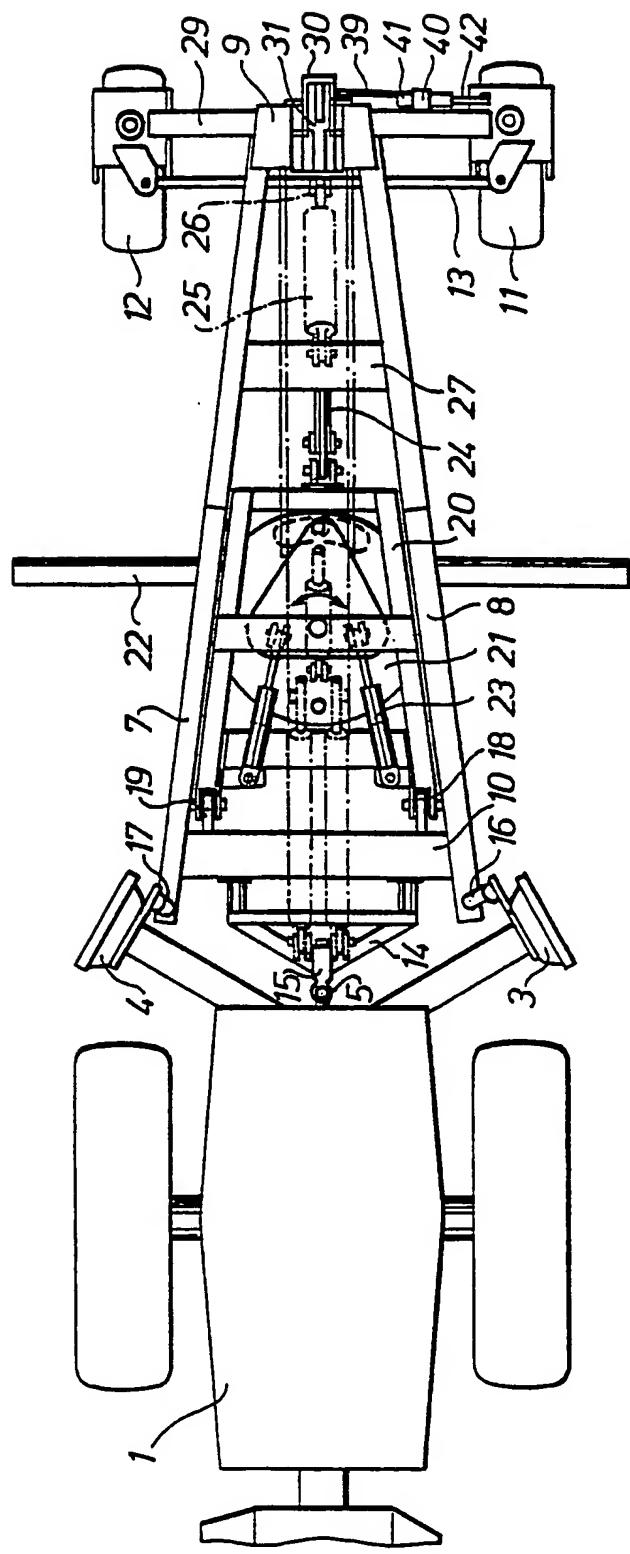
Fig. 2

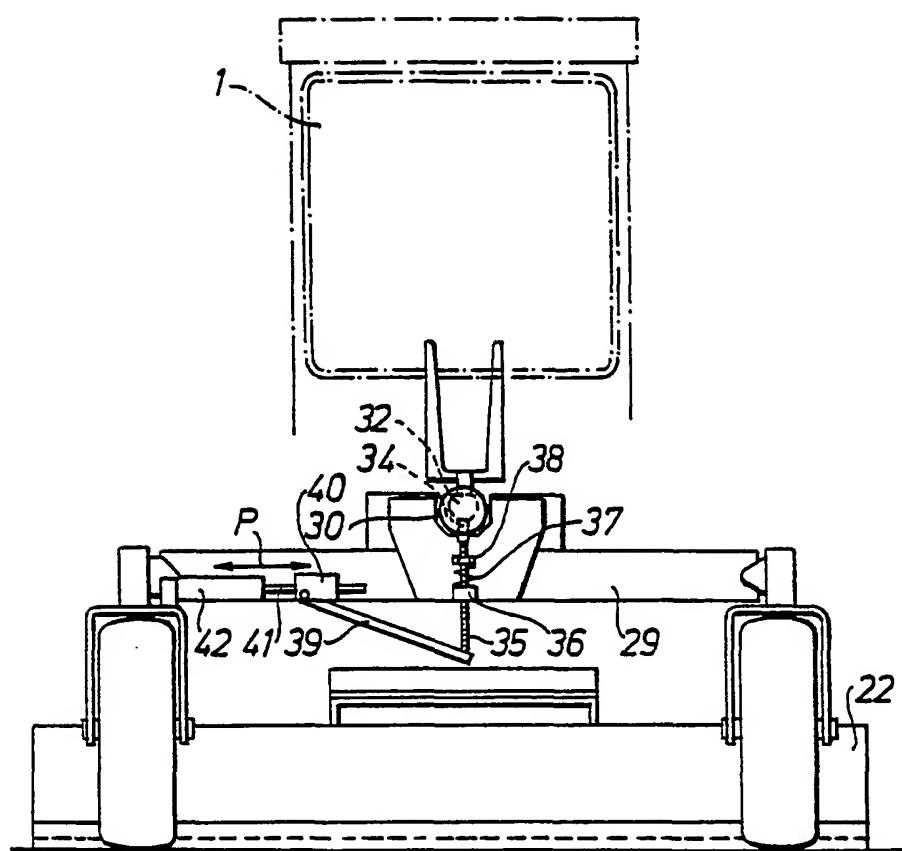
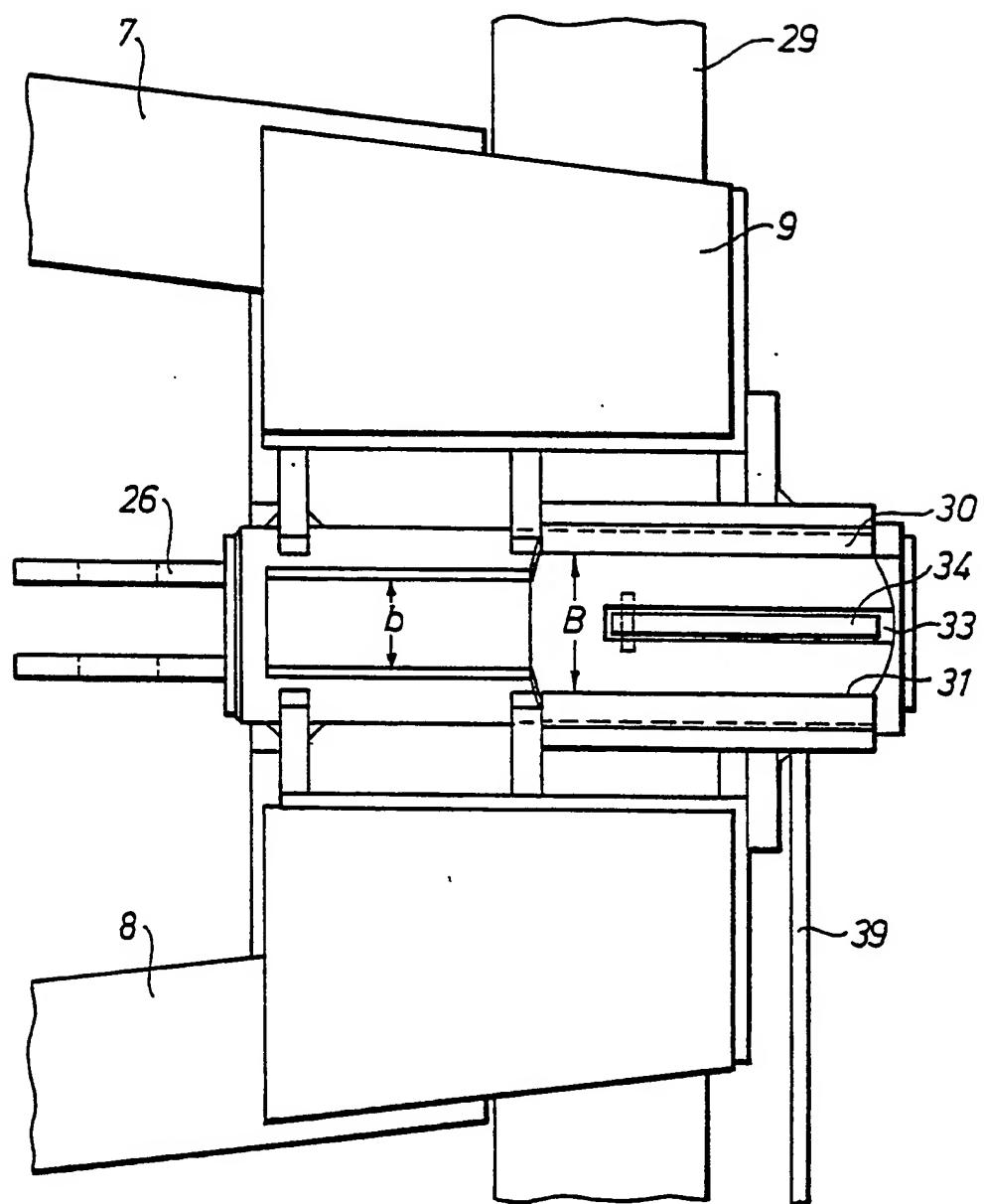
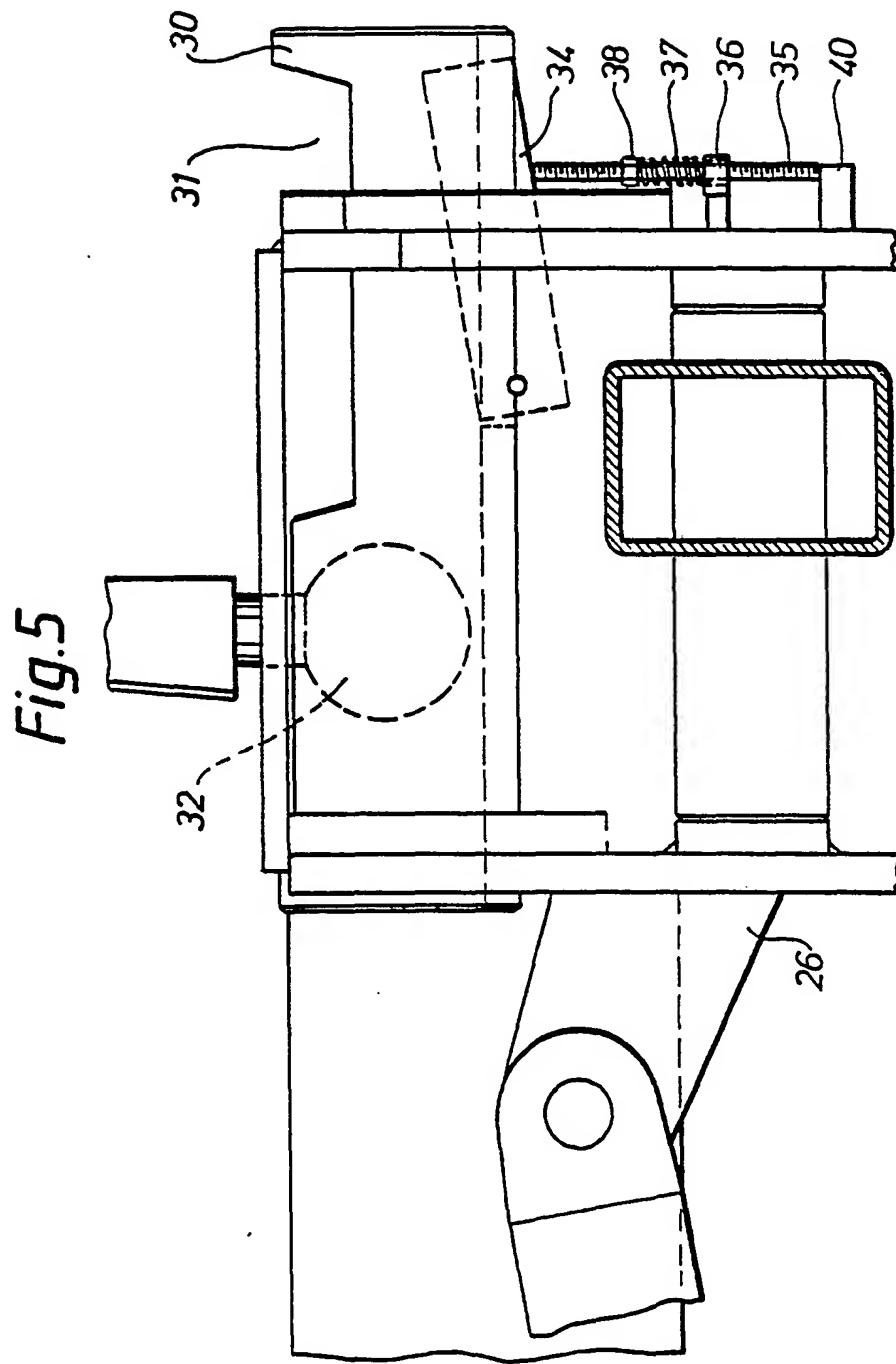
Fig. 3

Fig.4



INTERNATIONAL SEARCH REPORT

International Application No PCT/SE87/00117

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) ⁹

According to International Patent Classification (IPC) or to both National Classification and IPC 4

E 02 F 3/76

II. FIELDS SEARCHED

Minimum Documentation Searched ⁷

Classification System	Classification Symbols
IPC 4	E 02 F 3/76-/83
US Cl	37: 108, 117.5; 172: 777-834, 4.5

Documentation Searched other than Minimum Documentation
to the Extent that such Documents are Included in the Fields Searched ⁸

SE, NO, DK, FI classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT ¹⁰

Category ¹¹	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
A	SE, A, 8402673-1 (VRETN AB) 19 November 1985	
A	SE, A, 202 092 (VRETENS MEKANISKA VERKSTAD) 15 February 1966	
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IV. CERTIFICATION

Date of the Actual Completion of the International Search

1987-05-14

Date of Mailing of this International Search Report

1987-05-18

International Searching Authority

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